Picturing Time: How Taking Photos Affects Time Perception and Memory

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While people take pictures to hold onto times in their lives, we show that taking pictures actually speeds up subjective experiences of time, making time seem to fly. Further, taking pictures leads people to feel they remember the experience better; however, taking picture actually decreases how much one remembers long-term.

[to cite]:

[url]:
http://www.acrwebsite.org/volumes/1017249/volumes/v42/NA-42

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The Tricks of Time: The Impact of Time on Consumers’ Decisions, and Consumers’ Decisions Impact on the Perception of Time

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Paper #1: The End-of-Decade Effect
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Paper #2: Feeling Older and Giving Back: The Impact of Felt-Age on Pro-social Behaviors
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Paper #3: Picturing Time: How Taking Photos Affects Time Perception and Memory
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Paper #4: “Present” for the Future: The Unexpected Value of Rediscovery
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SESSION DESCRIPTION
Our goal in this session is to extend research on the influence of time perception on consumers' decisions, and conversely the influence of consumers' decisions on time perception. In this session, we focus on two variations of time perception. One way to alter time perception is by shifting people's sense of where they stand in the timeline of their lives (Montepare, 2009). Another way to alter time perception is by varying the context and framing of the time period (e.g., peak-end effect; Fredrickson & Kahneman, 1993). Extending the research on time perception, this session examines two important questions.

First, we explore how feeling younger or older than our actual age (time-perception with respect to oneself) influences the decisions we make. Hershfield and Alter present work on end-of-decade effects (i.e., being of an age that ends in 9). They show that as people get close to markers (end of a decade) associated with the passage of life, they feel subjectively older and have a greater need to search for meaning. These feelings increase consumers’ likelihood to make extreme decisions such as pursuing extramarital relations and taking part in marathons. Rozenkrants and Huang extend the idea of the disassociation between one’s felt-age and actual age. They show that people who are made to feel older versus younger are more likely to focus on the needs of others, and thus are more likely to partake in pro-social behaviors, such as donating and saving the environment.

Understanding how time perception influences subjective experiences and, subsequently, influences decision making is key in overcoming decision making barriers such as the desire for immediate reward and temporal discounting.

Next, we explore how the decisions consumers make regarding an experience can influence their perception of time. Barasch, Diehl, and Zauberman show that taking pictures during an experience creates a greater sense of immersion, a sense that time is passing quickly, and a greater subjective memory of the experience. Interestingly, taking pictures actually leads to worse objective memory perception of the experience. Zhang, Kim, Brooks, Gino, and Norton continue the explorations of how consumers’ decisions to capture their experiences influence time perception. They show that people forgo the option to document experiences (e.g., create a time capsule) and instead choose to partake in alternate activities. Interestingly, at a later point, people actually prefer to retrieve the documentation (vs. partaking in an alternate activities). This suggests that people have a flawed lay theory about the value of preserving their experiences in the present for future enjoyment. Given people’s mispredictions about how time will affect their experiences, these papers provide useful interventions to help consumers make decisions that maximize their enjoyment of experiences.

Collectively, the four papers shed light on how time perception influences consumers’ felt-age, choice, pro-social behaviors, and how one’s decision to freeze time and record experiences can impact one’s perception of time and the experience itself. These counterintuitive yet fun findings demonstrate that even constants like age and time can be shifted by context and “tricks.”

The End-of-Decade Effect

EXTENDED ABSTRACT
Chronological age is obviously associated with the passing of time. Yet, people often fail to identify with their true age (e.g., Montepare, 2009), with younger adults feeling subjectively older than they actually are, middle-aged adults feeling roughly their own age, and older adults feeling younger than they are (Montepare & Lachman, 1989). Recent research suggests that the non-linearity of subjective age can also be found at a more granular level. Namely, Galambos, Albrecht and Jansson (2009) find that when older adolescents advance from one age-related social–developmental bracket to another, they experience a “bottom-dog phenomenon” in which they have moved from comparing themselves to a reference group of late adolescents to a reference group of older individuals. In the present paper, we suggest that such feelings occur throughout the human life span, specifically as individuals move from one personal decade to the next. We propose a model in which reaching the end of a decade is associated with increased subjective age, a greater search for meaning in life, and actions that can be either destructive or productive.

One salient driver of subjective age may be the place that people occupy within their decade. The round numbers that signify the start of a subsequent decade are common, and valued in societies that operate on base-10 systems. For example, round numbers (e.g., 10, 20) were mentioned significantly more often than other numbers in a two-year sample of Dutch op-eds (Jansen & Pollmann, 2001), and they serve as goals, whether for baseball players trying to reach a batting average of .300, or SAT takers trying to progress to the next score bracket (Pope & Simonsohn, 2011).

With a salient round number marker every ten years, people are likely to first assess their subjective age in the context of their own personal decade, and then the overall life span. To examine this possibility, we analyzed archival data in which participants were asked whether they felt younger (coded as 1), the same age (coded as 2), or older than they actually were (coded as 3). People whose age ends in a “9” felt subjectively older ($M = 1.51, SD = .88$) than people of other ages ($M = 1.29, SD = .70$), $t(931) = 3.01, p = .003$, and this held true even when controlling for actual age, $F(1, 930) = 4.17, p = .04$. As a follow-up, we had Mechanical Turk participants ($N = 164; M_{age} = 30.83, SD = 10.32$ years) read one of two articles that appeared...
to come from the New York Times. Control condition participants were shown an article that suggested the presence of 3 distinct eras in the human lifetime, commencing at birth, age 7, and age 68. In the experimental condition, participants read about one additional era that commenced at their age plus one year (e.g., if the participant was 35, the next era started at 36). All participants were then asked how subjectively old they felt (3-point scale). Experimental condition participants felt subjectively older than control condition participants ($M_{\text{experimental}} = 2.19, SD = 0.70$; $M_{\text{control}} = 1.86, SD = 0.66$; $t(162) = 3.12, p < .01$).

Approaching the end of a personal decade may do more than just increase feelings of subjective age. To the extent that salient endings intensify emotional experiences (Erser-Hershfield, Mikels, Sullivan & Carstensen 2008) and promote introspection (O’Brien & Ellsworth 2012), we posit that facing the end of a decade will also be associated with a heightened search for meaning in life. To examine this idea, 155 participants were randomly assigned to one of three conditions, in which they completed a brief writing exercise and then answered questions that assessed whether they were searching for meaning in their lives (e.g., “At this moment I am thinking about my life more deeply than I normally do”; 1-7 scale). In the baseline condition, participants wrote about what they were going to do with their day tomorrow; in the control condition, participants wrote about what they thought the day before their next birthday would be like; in the experimental condition, participants wrote about what they thought the day before their last birthday in their decade would be like (e.g., 20-somethings wrote about the day before their 30th birthday). Results indicated that participants who imagined entering a new decade on their next birthday were more eager to seek meaning ($M = 4.45, SD = .82$) than were participants in the control ($M = 4.10, SD = .72$) and baseline conditions ($M = 3.98, SD = .87$), $F(2, 152) = 4.57, p = .01$; only follow-up pairwise differences between the experimental and baseline condition, and experimental and control conditions, were significant, $p < .02$.

Finally, when individuals face the end of a decade and search for meaning, we hypothesize that they will seek to find fulfillment in a variety of ways. Indeed, Baumeister (1991) has suggested that when a spotlight is placed on the self, people seek escape through either destructive, numbing activities or productive, transcendent ones. To this end, we examined the relationship between facing the end of a personal decade and a variety of outcomes. Across three archival datasets, compared to people with non-9-ending ages, those with an age ending in 9 were more likely to sign up for a dating site geared toward extramarital affairs, $\chi^2 = 28686.75, p < .001$, and commit suicide, $F(1, 526) = 9.28, p < .01$, but they were also more likely to sign up for marathons ($\chi^2 = 12.28, p < .001$) and to run faster marathons, $t(99) = 3.63, p < .001$.

In sum, people who are approaching a new decade in age tend to feel older, to seek out meaning more earnestly, and to commit both destructive and productive acts that signify a failed or ongoing search for meaning. These results add to a growing literature suggesting that people experience aging in fits and starts, and that the experience of advancing on a new chronological milestone activates a search for meaning.

Feeling Older and Giving Back: The Impact of Felt-Age on Pro-social Behaviors

EXTENDED ABSTRACT

“Age is just a number” is an adage used to maintain feelings of youth. But, what does it mean to dissociate your actual age from how old you feel? What are the downstream behavioral consequences? Prior research suggests that actual age has an impact on the choices we make (e.g., William & Drolet, 2005); surprisingly, actual age has little correlation with how old people feel (Barak & Schiffman, 1981). Despite physical and cognitive changes that come with actual age, people have to identify with a particular age for their “felt age” to align with actual age (Blau, 1956). Recent work shows that felt age can shift depending on feedback received from strength tests (Stephan et al., 2012) and memory tests (Hughes, Geraci, & De Forrest, 2013). We extend this research, and propose that, because felt age and actual age do not always align, how old people feel at the moment can drive behavior, independent of their actual age.

In this project, we examine the impact of people’s felt age on their pro-social behaviors, such as saving the environment and making donations. Prior literature suggests that as people get older, there is a greater benefit to focusing on being helpful and useful to others (Krause, Herzog, & Baker, 1992). Pro-social orientation also tends to increase with age (Van Lange, Otten, De Bruin, & Joireman, 1997). We propose that, even for those within the same actual age group, subjective feelings of age—which can easily be manipulated by marketers—can influence their pro-social behaviors. Specifically, we hypothesized that relatives to people who felt younger, those who felt older would focus more on the welfare of others, and thus be more likely to partake in pro-social behaviors.

We first pre-tested ways to manipulate people’s felt age, to establish that felt age is indeed different from actual age, and can be influenced through various stimuli. For instance, in one stimulus we asked participants (mean$_{\text{age}} = 31$, range$_{\text{age}} = 25-45$) to enter their demographic information, and then show them distribution information about others who were also taking the survey—the distribution of ages either had a mean of 55 years, or a mean of 21 years. Participants then rated how old they felt. We found that seeing a distribution of previous participants’ ages with the mean of 55 years old made people feel younger than a distribution with the mean of 21 years old ($p < .01$). In both studies 1 and 2, we used this manipulation of felt age.

Study 1 tested our main hypothesis—whether changes in felt age influence people’s tendency to partake in pro-social behaviors. Participants in the same age group as the pre-test filled out demographic information, which included the felt age manipulation. Next, participants viewed an advertisement for a fictional charity called LiFeNet, which provides mosquito nets to help prevent malaria. Participants then indicated on a scale, from $0$ to $100$, how much money they were willing to donate to the charity. We found that participants in the felt-old condition pledged more money than those in the felt-young condition ($p = .04$).

In study 2, we tested the proposed mechanism of focus on others. Participants entered their demographic information, which included the felt-age manipulation. Next, stated their likelihood to partake in four environmentally friendly behaviors. We employed behaviors that would impose inconvenience to the self (e.g., unplugging appliances after each use), so that taking part in these actions would suggest putting aside one’s own interests. Then participants completed the self-other interest inventory to measure how much they focused on others (Gerbasi & Prentice, 2013).

We averaged the four pro-environmental behaviors in the survey ($a = .62$), and then submitted this composite measure to analysis. We found that participants in the felt-old condition were significantly more likely to take part in pro-environmental behaviors than those in the felt-young condition ($p = .02$).

More importantly, a bootstrapped mediation analysis confirmed that the effect of felt-age on people’s commitment to pro-environmental behaviors was indeed due to the changes in their focus on...
others (95% CI: [0.023, 0.238]). That is, participants in the felt-old (vs. felt-young) condition showed greater focus on others, and this greater focus on others led to a greater likelihood to partake in pro-environmental behaviors.

In our final study, we tested whether the observed pattern could be reversed if people who feel younger are drawn to focus on others as well. Participants read a real campaign letter from United Way. To manipulate felt-age, we presented participants with pictures of teen-age volunteers (felt-old condition) or pictures of late-middle-aged volunteers (felt-young condition). Furthermore, we manipulated the self-vs-other focus through the Call to Action statement that focused on the self (“Find out how YOU can help”) or on others (“Find out how to help A PERSON in need”). Our dependent measures were intentions to volunteer, donate, and share information about this charity through social media channels and word of mouth (α = .96 across 9 measures).

Because feeling older leads to greater focus on others, we predicted that participants in the felt-old condition would not be affected by the Call to Action frame, whereas those in the felt-young condition would become more pro-social when they were led to focus on others. A significant interaction of Felt-Age x Call to Action Focus confirmed our hypothesis (p = .03). While participants in the felt-old condition were not influenced by the Call to Action frame, those in the felt-young condition were significantly more likely to support the organization when they read the other-focused (vs. self-focused) Call to Action statement (p = .02). The results suggested that the other-focused Call to Action frame successfully led participants who felt young to act like those in the felt-old conditions; that is, they became more willing to volunteer, donate, and spread the word about United Way. In summary, we provide preliminary evidence that “how old people feel” reflects more than a psychological state; it has a profound impact on whether one decides to donate money, volunteer, and save the environment.

**Picturing Time: How Taking Photos Affects Time Perception and Memory**

**EXTENDED ABSTRACT**

Until recently, pictures were taken sparsely and predominantly at special occasions (e.g., weddings, graduations); however, picture-taking has now become ubiquitous in everyday life. While consumers have different motivations for taking pictures, from strict documentation to sharing the moment with others, in some shape or form, pictures are taken in order to hold on to experiences that people want to preserve.

How will the act of taking pictures affect experiences and memory? On one hand, being behind a camera may distance individuals from the experience and shift their perspective from a participant to an observer (Storms 1972). Being less immersed in the situation, they may enjoy the experience less and time may seem to pass more slowly (Sackett et al. 2010). On the other hand, taking pictures may draw people into the event, causing them to feel more immersed. Research on mindfulness and “flow” has shown that this leads to the feeling that time seems to pass without notice (Csikszentmihalyi 1988). As such prior literature provides support for predicting that taking pictures can increase as well as decrease immersion and time perception.

Prior work on memory and photography has focused on the role pictures, once taken, can play in cueing past memories. However, one recent paper (Henkel 2014) showed that compared to simply observing, being directed to take pictures can impair object recognition. However, prior work has not investigated how freely taking pictures affects memory, particularly for non-visual information (e.g., explanations provided by guides).

In this work we examine how taking pictures will affect experiences, as well as objective and subjective memories of the event. In one field study and two lab experiments, we find that the act of taking pictures can speed up subjective experiences of time, creating the experience that time is flying. Further, people feel they remember the experience better if they had not taken pictures, a quality of memory not previously studied. However, this boost in subjective memory is opposite to the effect picture taking has on objective memory: picture-taking actually decreases how much information one remembers in the long run.

In a field study examining the effect of photo taking, we recruited 100 individuals at a local archaeology museum. Before entering one of the galleries, half the participants were instructed to “take as many photos as possible,” while the other half was instructed to “view the exhibit as you normally would.” Immediately after viewing the exhibit, participants filled out a short questionnaire (Time 1). 37% also completed an online follow-up survey four days later (Time 2). An ANOVA revealed that taking photos significantly increased the extent to which participants felt immersed in the experience (F(1,96)=8.22, p=.005). Further, at time 2 we found that while participants who took photos felt they remembered their experience better (F(1,35)=8.08, p=.002), they were actually less likely to correctly answer a question about the exhibition (X^2=4.50, p=.035).

In order to study the act of taking pictures in the lab, we developed a unique computer interface that allows respondents to “experience” by watching a first-hand video of an event and taking pictures by clicking a button. In our studies, participants watched several sightseeing bus tours which ensured that every participant had the same experience and also exposed participants to verbal information (i.e., information provided by the tour guide) which formed the basis for our objective memory examination.

In one study 236 participants were assigned either to take pictures or to simply experience these bus tours. Measures of immersion and time perception were taken immediately after the experience. Participants were also contacted again a week later (67% response rate) and responded to subjective and objective memory questions. Replicating our findings from the field we find that taking pictures heightens feelings of immersion in the experience (F(1,232)=22.87, p<.001) and also creates the feeling that time passes more quickly (F(1,232)=3.77, p=.05). Further, taking pictures slightly increased subjective memory perceptions (F(1,219)=2.91, p=.09) but significantly reduced how many questions participants could answer correctly (F(1,219)=7.29, p<.01).

Across both studies, we find that taking pictures heightens immersion in an experience and the sensation that time flies. We predict these effects will depend on whether taking pictures is an intrusive versus seamless part of the experience. When picture-taking is intrusive (e.g., large lens camera) people may take more of an observer role: they feel less immersed and time passes more slowly. However, when taking pictures is unobtrusive (e.g., ski goggles that take pictures) taking photos may heighten immersion and speed up time perception.

In order to test this prediction, in a study with 561 participants, we tested whether the extent to which picture taking is intrusive affects immersion, time perception, and memory. In the previous study participants could take pictures by simply clicking a button. We retained that condition, as well as the “no photo” condition, and add two more intrusive photo taking conditions. In one, participants had to “drag” a camera cut-out with their mouse and align the camera’s viewfinder with the center of the video. In another, in addition to
dragging the camera, participants could “delete” photos as they proceeded through the tours. Replicating our findings, taking photos, regardless of the interface, sped up time perceptions (F(1,556)=14.89, p<.0001). Moreover, taking vs. not taking photos again increased subjective memory perceptions when the photo interface was low or moderately intrusive (F(1,556)=14.72, p<.0001). However when the interface was more distracting, participants rated their memory lower and comparable to not having taken pictures (p>.15). For objective memory performance, a similar pattern emerges: taking photos easily or with limited disruption leads to worse objective memory performance than not having taken pictures (F(1,556)=3.77, p=.05) or when having the ability to delete photos (F(1,556)=8.77, p<.01).

In sum, across these different experimental settings we find causal evidence that taking vs. not taking pictures can heighten the extent to which people feel immersed in the experience and can create a sensation that “time is flying”. Further, while taking pictures heightens the belief that one remembers more, taking pictures tends to reduce how much one actually remembers.

A “Present” for the Future: The Unexpected Value of Rediscovery

**EXTENDED ABSTRACT**

Many moments in everyday life, from breakfast choices to iTunes playlists, seem too mundane to be worthy of preservation, or are so salient in the moment that it seems hard to imagine forgetting them. Should we forget those mundane moments, however, documenting the present offers one clear benefit: it allows for rediscovery in the future. Across three longitudinal studies using a “time capsule paradigm,” we show that individuals underestimate the future value of rediscovering today’s seemingly mundane experiences. Consequently, individuals forgo opportunities to document the present, but prefer to rediscover that present in the future.

A large body of research documents a host of errors in predicting future affective reactions. People have difficulty in predicting how they will feel in the future (Gilbert, Gill, & Wilson, 2002; Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998; Kerner, Driver-Linn, Wilson, & Gilbert, 2006; Wilson & Gilbert, 2005) and in estimating the emotional impact of both negative and positive events (Frederick & Loewenstein, 1999; Fredrickson & Kahneman, 1993; Gilbert, Morewedge, Risen, & Wilson, 2004; Gilbert et al., 1998; Wilson & Gilbert, 2005). Whereas prior research has focused on how people mispredict their affective responses to future experiences, we explore people’s mispredictions of how they will feel in the future when they rediscover past experiences.

In Study 1, undergraduates created time capsules capturing a range of everyday experiences, including a recent conversation, three songs to which they had recently listened, and an inside joke. For each item, individuals predicted the extent to which they would be curious to read what they had documented and find their time capsules interesting in the future. Three months later, we compared these predictions to their actual reactions before and after opening their time capsules. We found that people mispredict how their future selves will feel when they rediscover their past experiences: they not only underestimate how curious they will feel to open their time capsules, but also how interesting they will find the process of rediscovery.

In Study 2, we explore whether people are more likely to underestimate the value of rediscovering the simpler, more mundane experiences of everyday life, as compared to the extraordinary experiences, which they likely expect to enjoy remembering. In a longitudinal study across seven months, participants rated the extent to which the conversation they documented was ordinary and predicted the curiosity and interest they would feel while rediscovering these conversations. Our results reveal that the unexpected value people receive from rediscovery stems at least in part from the pleasure of reflecting on the simpler aspects of ordinary life; in contrast, the pleasure of rediscoveries is better anticipated or even overestimated for memories that are already extraordinary and memorable.

Studies 1 and 2 document how and when individuals mispredict the pleasure of rediscovering the past. In each study, however, participants were given no choice: they were required to both document and reflect on their experiences. Thus, while we have shown that people underestimate the value of rediscovery, we have not yet shown that this misprediction also leads them to forgo engaging in behaviors that allow for future rediscovery: documentation itself. Furthermore, we examined whether overconfidence in memory is a possible psychological driver of the failure to appreciate the value of rediscovery. In this longitudinal study, participants at Time 1 chose between documenting an experience and engaging in an alternative fun activity (watching an interesting video). Regardless of their choice, participants completed both tasks and then predicted the extent to which they would find the experience of opening the time capsule and watching a similar video curiosity-provoking and interesting in the future. As part of our measure of overconfidence in memory, they also predicted the percentage of the documentation they would remember. One month later (Time 2), they chose between rediscovering the experience they had documented and engaging in an alternative fun activity (watching a similarly interesting video). Regardless of their choices, participants did both and then rated their actual memory, curiosity, and interest for both the time capsule and the similar video.

Study 3 demonstrates that underestimating the joy of rediscovery leads individuals to make time-inconsistent choices: they choose to forgo opportunities to document the present, only to find themselves preferring to retrieve those past records in the future. Although they were inaccurate in predicting their enjoyment of rediscovering the past, participants did accurately predict the extent to which they would enjoy watching a similar video in the future. In sum, these results show that our participants are not universally poor predictors, but instead seem to underweight the value of rediscovery in particular. Finally, our results suggest that people’s misprediction of their memory in part drives their misprediction of the pleasure from rediscovery.

Across three longitudinal studies, we find that people underestimate the extent to which they will find today’s experiences curiosity-provoking and interesting, leading them to forgo the opportunity to document the present even though they later choose to rediscover it. At least in part, the phenomenon arises because individuals fail to realize that they will forget the mundane details of their current experiences, such that the misprediction of the value of rediscovery occurs particularly for ordinary, rather than extraordinary, experiences. As one participant put it: “Re-reading this event of doing mundane stuff with my daughter has certainly brightened my day. I’m glad I chose that event to write about because of the incredible joy it gives me at this moment.” By recording ordinary moments today, the present can become a “present” for the future.

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